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Concentration-dependent self-diffusion of liquids in nanopores: A nuclear magnetic resonance study

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Abstract

The details of molecular motion of low-molecular-weight polar and nonpolar organic liquids in nanoporous silicon crystals were studied using nuclear magnetic resonance. The effective self-diffusion coefficients were found to pass through a maximum with increasing concentrations for all liquids. A generalized model for the effective self-diffusion coefficient was developed by taking into account the concentration dependent coexistence of capillary condensed, adsorbed, and gaseous phases. The applicability of the mesoporous range in the model was extended by the explicit use of the adsorption isotherm properties, and this highlighted the role of surface interaction for the transport of molecules in small pores.

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